AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application.

COMPLETE LISTING OF THE CLAIMS:

Claims 1-4 : (Canceled)

Claim 5 : (Currently Amended) A phase error detector for generating a phase correction signal to correct a phase difference between a reference frequency of a voltage-controlled oscillator and a carrier frequency of a received signal which is received by a quadrature-amplitude modulated (QAM) receiver, the phase correction signal having a zero-crossing locking point, the received signal having in-phase components and quadrature components in a plurality of decision regions, the phase error detector comprising: a plurality of different algorithms arranged in an order; and the phase error detector being operative for successively executing the algorithms in the order, for each of the plurality of decision regions, until the phase correction signal having no additional zero-crossing locking points is generated, wherein the order of the algorithms is:

$S1 = FQ\ f(ZI) - FI\ f(ZQ)$

$S2 = \pm 2\ FQ\ f(ZI)$

$S3 = \pm 2\ FI\ f(ZQ)$

$S4 = \pm 2\ ZI\ ZQ$

$S5 = 0$

in which S1, S2, S3, S4, S5 are different phase correction signals, in which ZI and ZQ are the in-phase and quadrature components of the received signal, in which FI and FQ are offsets of ZI and ZQ, in which f (ZI) = ZI or sign (ZI), and f(ZQ) = ZQ or sign (ZQ).

Claim 6 : (Currently Amended) The phase error detector of claim 5, wherein the phase error detector is operative for executing different ones of the plurality of algorithms for all of the plurality of decision regions.

Claim 7 : (Canceled)